Instrumentation Frontier Introduction

Oct 5, 2020

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Instrumentation Frontier

Wiki: https://snowmass21.org/instrumentation/start

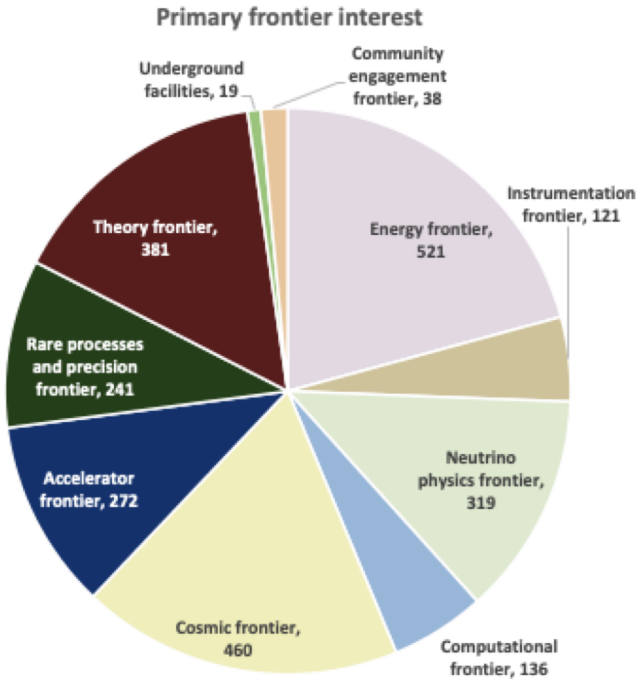
The Instrumentation Frontier is geared to discuss **detector technologies and R&D needs for future experiments in collider physics, neutrino physics, intensity physics and at the cosmic frontier**. It is divided into diagonal topical groups with some overlap among a few of them. Synergies between the different topical groups, as well as with other Frontier groups and research areas outside of HEP will be paid close attention to.

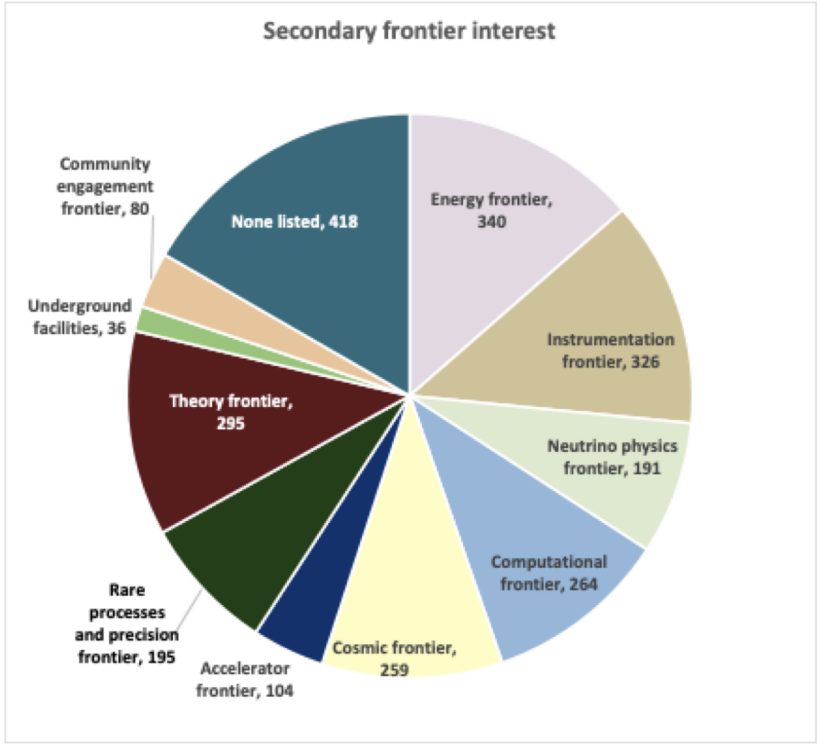
"New directions in science are launched by new tools much more often than by new concepts.

The effect of a concept-driven revolution is to explain old things in new ways. The effect of a tool-driven revolution is to discover new things that have to be explained"

Freeman Dyson

Instrumentation Frontier





Instrumentation Frontier – Topical Groups

Topical Group	Co-Conveners			
Quantum Sensors	Thomas Cecil (ANL)	Kent Irwin (SLAC)	Reina Maruyama (Yale)	Matt Pyle (Berkeley)
Photon Detectors	Chris Rogan (KU)	Juan Estrada (FNAL)	Mayly Sanchez (ISU)	
Solid State Detectors and Tracking	Tony Affolder (UCSC)	Artur Apresyan (FNAL)	Lucie Linssen (CERN)	
Trigger and DAQ	Darin Acosta (Florida)	Wes Ketchum (FNAL)	Stephanie Majewski (Oregon)	
Micro Pattern Gas Detectors	Bernd Surrow (Temple)	Maxim Titov (SACLAY)	Sven Vahsen (Hawaii)	
Calorimetry	Andy White (UTA)	Minfang Yeh (BNL)	Rachel Yohay (FSU)	
Electronics/ASICS	Gabriella Carini (BNL)	Mitch Newcomer (Penn)	John Parsons (Columbia)	
Noble Elements	Eric Dahl (Northwestern)	Roxanne Guenette (Harvard)	Jen Raaf (FNAL)	
Cross Cutting and System Integration	Jim Fast (JLab)	Maurice Garcia-Sciveres (LBL)	Ian Shipsey (Oxford)	
Radio Detection	Jim Beatty (OSU)	Abigail Vieregg (Chicago)		

- Other topics being covered: Gravitational Wave Detection, Neutron Detection, etc
- Please let us know if concerning more topics/subjects

Liaisons

- **High-level and bi-directional communication between Frontiers**
- **Expertise and experience in both communities**
- **IF liaisons**
  - Energy Frontier: Caterina Vernieri (SLAC), Maksym Titov (CEA Saclay)
  - Neutrino Physics Frontier: Mayly Sanchez (ISU), NF10
  - Rare Processes and Precision: Marina Artuso (Syracuse)
  - Cosmic Frontier: Kent Irwin (SLAC), Hugh Lippincott (UCSB)
  - Accelerator Frontier: Andy White (UTA)
  - Computational Frontier: Darin Acosta (Florida)
  - Underground Facilities: Eric Dahl (Northwestern), Maurice Garcia-Sciveres (LBNL)
  - Community Engagement: Farah Fahim (FNAL)
  - Early Career representatives: S. Butalla (FIT), K. Dunne (Stockholm), J. Zettlemoyer (FNAL)

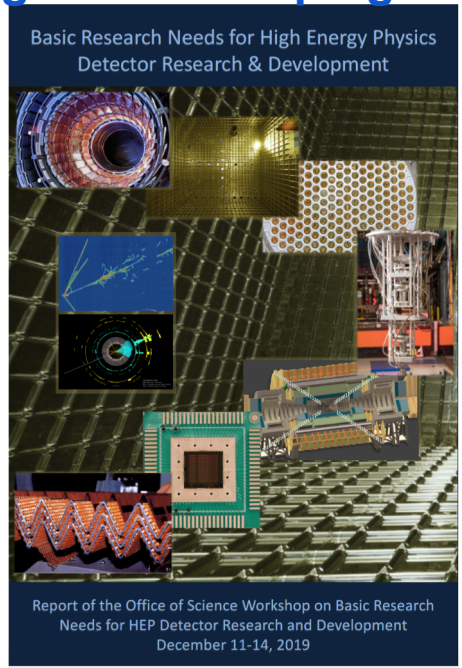
LOI and Contributed Paper

- **LOI**
  - Excellent input from all of you (~340 LOIs related to IF)
  - High-level summary presentation today (P. Barbeau)
  - Dedicated workshops/meetings on LOIs in the near future by topical groups

- **Contributed paper**
  - Instruction on Snowmass 2021 Wiki page
  - Deadline July 31, 2021
  - Will be part of the permanent record of Snowmass 2021
  - Look forward to receiving yours!

DOE Detector R&D BRN Report

- **Great input for Snowmass IF studies. We should build on the research plans presented in this BRN study for the relevant topical areas, by developing and refining them further and introducing and developing new instrumentation ideas**
- ***"Transformative discovery in science is driven by innovation in technology. Our boldest undertakings in particle physics have at their foundation precision instrumentation. To reveal the profound connections underlying everything we see from the smallest scales to the largest distances in the Universe, to understand its fundamental constituents, and to reveal what is still unknown, we must invent, develop, and deploy advanced instrumentation".***



Breakout Goals

- **CPM Parallel Sessions (YKK)**
  - First opportunity to bring together the community across the field
  - Focus on inter-frontier discussions
  - Establish cross working group connections
  - Identify gaps and areas to focus / to study
  - Brainstorm new ideas

- **Therefore, please**
  - Actively participate in these sessions, contribute to and articulate the topics, develop and shape the discussion points, provide and collect the needed information on topical areas, and engage collaborators

https://docs.google.com/spreadsheets/d/19hGF8XcoGux3lV_ACIEeXbze3EJPFWBWPbGOF6Gegcl/edit#gid=1375673765

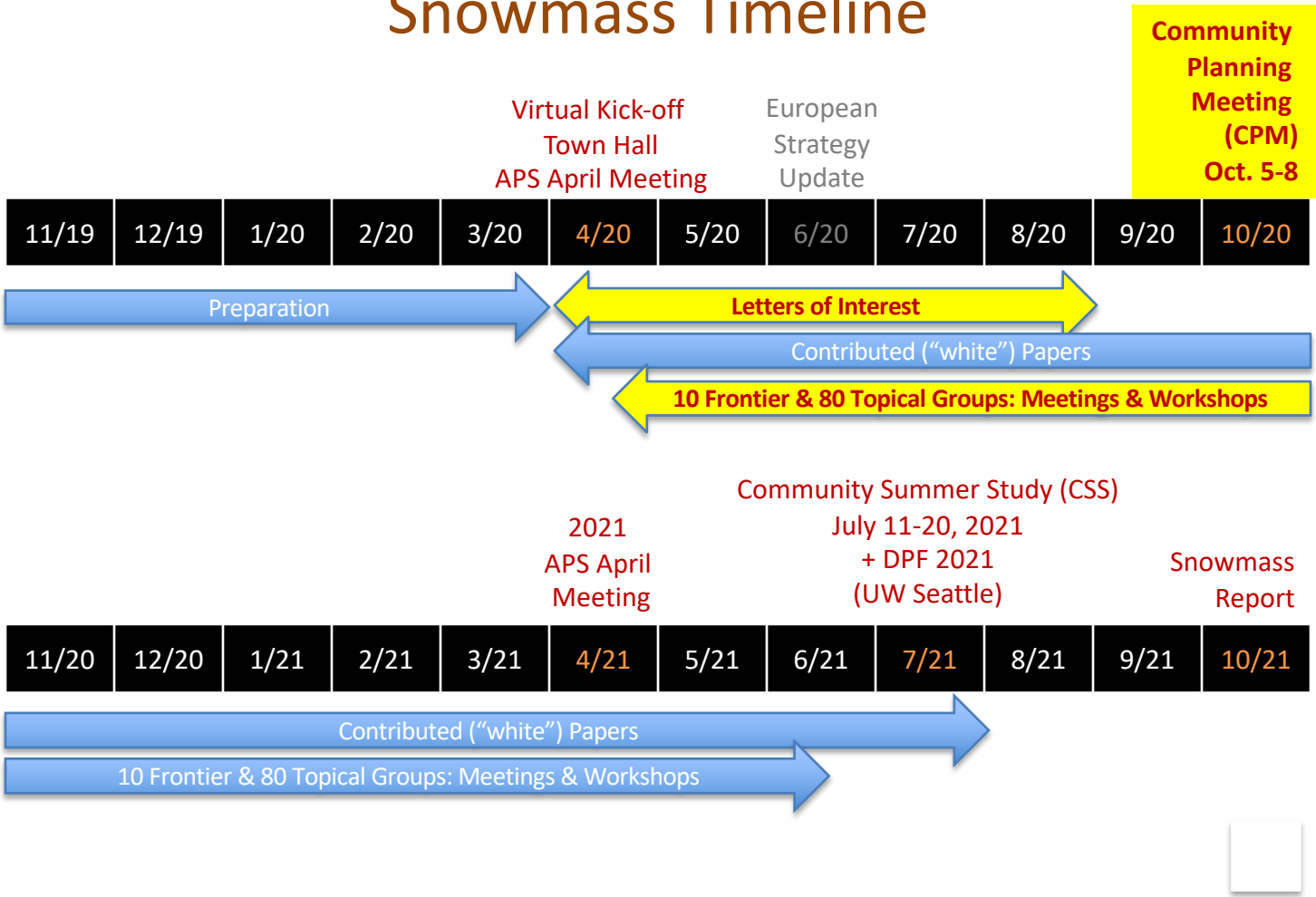
http://zgecse.web.cern.ch/zgecse/SessionTimeline.html

IF Related Breakout Sessions

- **Introduction (Session 9)**
- **Inter-frontier sessions**
  - EF&RF focused: #26, #130, #131
  - NF focused: #51
  - CF focused: #69, #70, #71, #74, #137, #140
  - AF focused: #54, #187
  - Multi: #77, #102
  - CompF focused: #123
  - UF focused: #122
  - CommF focused: #57, #118, #119

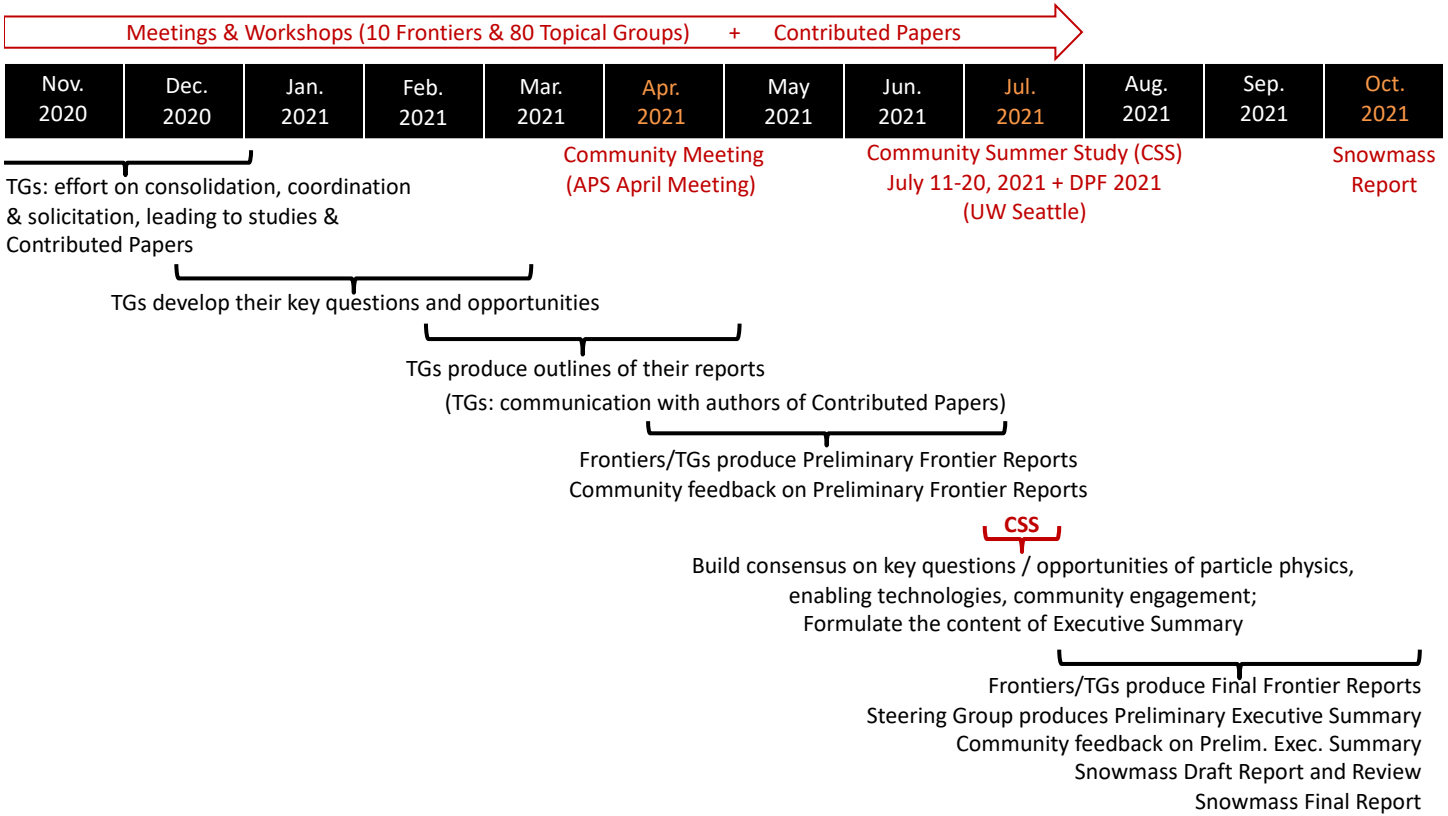
- **IF Planning (Session 209)**
  - Brief discussions on key points to be collected during CPM, categorized into a few aspects
  - Brief discussion on next steps

Snowmass Timeline



Preliminary Snowmass Timeline / Process

Starting point for discussion with the community during CPM



Near Term

- **IF forward**
  - Series of meetings for acknowledging and studying LOIs
  - Identifying gaps and comprehending the inter-frontier requirements
  - Starting developing the theme and frame to assemble the IF studies
  - Communicating contributed papers

- **Joint workshops**
  - MutilHEP 2020, Nov 10-12
  - Joint workshop with NF, CPAD workshop (as IF workshop) in the week of Mar 14, 2021
  - Other workshops being discussed (stay tuned)